Integrated Model for Conjunctive Analysis of Water Supply Reliability, Water Quality and Ecosystem Health in California's Water Resouce Management

George B Matanga

Public Comments

No public comments were received for this proposal.

Technical Synthesis Panel Review

Proposal Title

#0167: Integrated Model for Conjunctive Analysis of Water Supply Reliability, Water Quality and Ecosystem Health in California's Water Resouce Management

Final Panel Rating
adequate

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

Dr. Matanga has submitted an interesting proposal to link a hydrologic model with CALSIM to examine interrealtionships among water supply reliability, water quality, and ecosystem health under changing climate conditions and different management scenarios. The main purpose of the proposal is to enhance an existing model, IHSim, by adding algorithms for snowmelt, temperature, dissolved oxygen, nutrients, and sediments. IHSim is a 3D subsurface flow and transport and 2D surface water flow and transport model. The strength of this proposal is its regional relevance. Given the dwindling storage in the mountain snowpack, conjunctive use management strategies will receive much more attention, and proposed research will provide useful information for future management of California water resources. One weaknesses of the proposal is that it is unclear how well IHSim performs –– none of the references describe IHMS specifically, and it would be helpful to have some idea of model performance before CALFED invests in this proposal. The team developing the model is composed of quite experienced modelers with engineering backgrounds; however the team seems to lack the ecological and biogeochemical expertise required for the proposed enhancements. The team severely underestimate the difficulty of not just writing the code but obtaining the data required

as inputs to be able to test the submodels. It is also not clear if the proposed research will be of immediate benefit to decision makers –– the proposed project can provide useful information _if_ the applicants use alternate climate and management scenarios as input to the coupled modeling system. It is not clear if this will be done as part of this study or how these scenarios will be constructed. Nevertheless, the proposed model development and validation activities will provide a modeling package that is of potential use to CALFED agencies. The model was apparently developed by a private firm and is being used by the Bureau of Reclamation and other CALFED agencies under a licensing agreement. The legal aspects of the licensing agreement should be clarified, especially because the proposal would lead to enhancements of the model. Would the enhanced model be in the public domain? Two study sites will be used to test the enhanced model. One is a small. well–studied site in the Central Valley and seems a reasonable place to do the evaluation. The other is the Stanislaus River for which insufficient data are available to test the enhanced model.

Additional Comments:

Dr. Matanga has submitted an interesting proposal to link a hydrologic model with CALSIM to examine interrealtionships among water supply reliability, water quality, and ecosystem health under changing climate conditions and different management scenarios. The main purpose of the proposal is to enhance an existing model, IHSim, by adding algorithms for snowmelt, temperature, dissolved oxygen, nutrients, and sediments. IHSim is a 3D subsurface flow and transport and 2D surface water flow and transport model. The strength of this proposal is its regional relevance. Given the dwindling storage in the mountain snowpack, conjunctive use management strategies will receive much more attention, and proposed research will provide useful information for future management of California water resources. One weaknesses of the proposal is that it is unclear how well IHSim performs –– none of the references describe IHMS specifically, and it would be helpful to have some idea of model performance before CALFED invests

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Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

This proposal’s strengths include that it examines conjunctive–use in the face of climate change, and that the project team is capable and includes engineering modelers. It addresses a topic of significant regional interest.

There were a number of concerns regarding the proposal. The project team has identified the issues they will need to address in order to bring the project to fruition; however, the panel was concerned that the applicants did not appreciate the difficulties associated with adding the biogeochemical and

ecological components data to these models. Also, it was not clear that the applicants' proposal would adequately test their model, although they claim that it will.

The proposal includes only limited evaluation of alternative scenarios; thus it is largely a modeling−exercise. Given the limited scenario−evaluation incorporated in this proposal, the immediate relevance of the results to decision−makers is uncertain. Much of the work would be done by contractors, so there was a concern about the accountability of the project team for end products.

The panel was concerned about significant gaps in the documentation of the IHSim model. This model is not described in sufficient detail and even the articles cited regarding this model do not describe the model adequately to allow the panel to assess its validity in this context. In addition, IHSim is a propriety model. The usefulness and transferability of results stemming from the linkage of IHSim to another (non−proprietary) model are uncertain and may very clearly be addressed in the proposal.

Rating: adequate

Technical Review #1

proposal title: Integrated Model for Conjunctive Analysis of Water Supply Reliability, Water Quality and Ecosystem Health in California's Water Resouce Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**Yes, it is an attempt to develop reasonable simulations of hydrologic processes to modify input to monthly reservoir operation models (such as CALSIM). If desired, I think the project could be split in two: the mountain basin hydrology sample (Stanislaus River basin) and the integrated farm drainage management problem.**
Rating	**very good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The hydrology proposal reaches into several modeling approaches to integrate them into detailed input for not only flow but temperature, nutrients, and dissolved oxygen. This would make it a very useful tool in analyzing climate change and the effects of watershed treatment, and perhaps even for large fires.**
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**It would appear to be able to provide decision makers with potential effects of watershed treatment practices and the impact of global warming. The drainage projet portion should be able to demonstrate the sustainability and costs of these measures for coping with saline drainage.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The proposal writers seem to have a good understanding of the problems, available models, and a way to link the best of existing approaches. The effort is to be concentrated into two pilot studies or demonstrations with adequate funding sought to do the job.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The proposed projects will be primarily simulation of natural processes, with a need for adequate field data to verify the modeling. There may be a need to collect more watershed data on the Stanislaus River basin to calibrate planned models.**

Rating	**very good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**If successful on the sample watershed basin or farm, the procedures or models could be expanded to the entire Sacramento–San Joaquin drainage basin. The key is how much better the modeling simulation is compared to existing tools.**
Rating	**very good**

Additional Comments

Comments	**The incorporation of a proprietary model, IHSim, in the overall project set of models may limit its deployment. It would be good to make sure, if possible, that the package would be freely or cheaply available to all agencies in the State, beyond just the CALFED program and partners.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**I do not personally know the authors. Dr Matanga, the project leader, has some very impressive and broad modeling experience, judging from his resume. It would appear that they have assemble a good team able to develop the multiple strands of modeling into an integrated hydrology approach.**
Rating	**good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The $ l.1 million may seem expensive, but the proposal is ambitious and will need funding in that magnitude, in my opinion. They are basically trying to move modeling capability for the Bay–Delta watershed into a new level of complexity.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**The proposal would advance the state of watershed modeling to incorporate other constituents beyond flow and volume. The authors will tie the results into the existing CALSIM model for maximum usefulness. It would then be a good tool to evaluate watershed practices, development, and climate change effects.**
Rating	**very good**

Technical Review #2

proposal title: Integrated Model for Conjunctive Analysis of Water Supply Reliability, Water Quality and Ecosystem Health in California's Water Resouce Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives are clearly stated and appear to be consistent. The idea of constructing an integrated hydrology−water quality model to evaluate climate change effects and impacts to California's water supply and ecosystem health is timely and important.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study is justified based on existing knowledge. The conceptual model is clearly stated and provides a basis for the proposed work. The selection of two pilot projects shows a wide range of potential applications for the IHSim model although the focus on two different pilot projects (instead of just one) may dilute the focus of the project.**
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach appears to be well designed to meet the project's objectives, although ambitious. The approach should be feasible if sufficient resources are available to meet the multiple objectives of adding new features to the IHSim model, linking IHSim to CalSim, and demonstrating the model on two different pilot projects (IFDM and Stanislaus). If successful the project will generate useful information and provide climate change input to CalSim. This will be useful to decision makers.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The approach is documented, although many technical questions remain to be answered (in particular, climate change input data). The likelihood of success will be highly dependent on the ability to coordinate four major components (adding new features to the IHSim model, linking IHSim to CalSim, and demonstrating the model on two different pilot projects (IFDM and Stanislaus)). The scale of the project is consistent with the objectives, but it may be beyond the grasp of the authors depending on the budget and resources available.**
Rating	**good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**There is no major monitoring component to this project.**
Rating	**fair**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**The products of this project could be of very high value following successful completion of the major tasks. The contributions in terms of available water quantity and quality are very relevant to the larger picture of ecosystem health.**
Rating	**excellent**

Additional Comments

Comments	**None.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**There are a large number of authors for this project. In general they appear to have experience to successfully implement the proposed project. Coordination of work schedules and efforts will be key to the project's success. USBR and the other team members should have the necessary infrastructure to**

	accomplish the project.
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget of $1.1M appears to be on the low side of what is necessary for this project. Much of the budget is assigned to a lump sum amount for consultant work. It is not clear how many project hours these lump sum amounts represent. Approximately $250K is for Task 1 (adding features to IHSim); this may be insufficient to conduct literature search and add and test code for snowmelt, temperature, DO and nutrients, and sediment.**
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**Overall I think that this is a worthwhile project. The project is very ambitious and is really four projects in one. My one major concern is the vast scope of the project and the ability to successfully coordinate all of the activities and still remain within the project budget.**
Rating	**very good**

Technical Review #3

proposal title: Integrated Model for Conjunctive Analysis of Water Supply Reliability, Water Quality and Ecosystem Health in California's Water Resouce Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The primary goals – to enhance IHSim, to couple it with CALSIM, to test the integrated modelling system and to disseminate the results – are clearly stated in general terms. There is little objective information available regarding the application of IHSim and consequently, I have judged the proposal, accepting IHSim as a sound modelling system . The reviewer concurs that a fully−coupled, conjunctive modelling system is relevant to the California Water System, given its sensitivity to and dependence upon a wide variety of societal, industrial and environmental variables.**
Rating	**very good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The proposal is justified in terms of IHSim's expected ability to forecast water supply reliability, water quality and ecosystem health with a far greater degree of accuracy, under climate change conditions.** **The proposed case studies appear to be well−chosen.**

	They address different scales of operation (small and large), different environmental settings (IFDM and watershed) typical to California's Water System and different properties to be monitored (salinity, DO, etc...). Having said that, CALFED could undoubtedly select any number of sites that would also present the ability to test the enhanced IHSim system on its own, as well as the coupled CALSIM-IHSim modelling system. Even if other sites were selected, I don't believe it would devalue the currently proposed sites or the justification behind the case studies.
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**Although the proposal excludes many details regarding the enhancement of IHSim, the work to be done matches the mathematical models already incorporated into IHSim. Therefore, if we consider the parameters relevant to the SWP and CVP independently, then the approach is a realistic one and perhaps, there is no reason to doubt its potential. Since the goal is a conjunctive, integrated modelling system, further discourse in this regard would've been appreciated. While many elements of the proposal do indeed take this into account (team members required for coupling CALSIM with IHSim), very little is mentioned about the possible snares involved in the mathematical modelling when so many interdependent parameters are at hand.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**On paper, the primary team is a very competent one and so, in this regard, the scale of the project is not beyond them. I believe that CALSIM−IHSim would be a more robust modelling package: one that can serve CALFED well. Therefore, I am confident of the success if we expect improved, integrated data interpretation. Whether CALSIM−IHSim will be as effective in terms of conjunctive subsurface/surface hydrologic analysis as the proposal hopes for is not clear but this goal is in many ways secondary to the former.**
Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**Monitoring of the enhanced IHSim, as well as the linked CALSIM−IHSim model is clearly included in Phases 1 and 3 of the proposal. The interpretation of pre−post monitoring is included in Phase 4.**
Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Many products will be derived from the research. It serves to benefit:** **(1) the management of IFDM systems**

	(2) the CWB and SVB in terms of water supply, quality and ecosystem impacts under climate change scenarios. **(3) CALFED agencies, as they will have free access to CALSIM-IHSim.**
Rating	**very good**

Additional Comments

Comments	**I get the impression that the authors were pressured by the deadline and consequently, proofreading and a few details were omitted. The following errors were noted in the Project Form:** **(1) The keywords were not carefully selected. (I am not certain if this is an error inherent to the formatting of the file or not.)** **(2) The question regarding this, or similar, proposals being submitted to CALFED was answered in the negative but the consequent table was completed (which is only intended in the case of a positive response).**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**A brief review of the authors' previous respective performances indicate that this project lies well within their ability and that the infrastructure is indeed in place to execute it.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget is not acceptable in its present form. In particular, the lump sums to be paid to the subcontractors – which amount to one-third of the total funding request – is worrisome in terms of potential double counting. Such concern would not be warranted if the Task Table were more carefully laid out. Each task related to IHSim enhancement should have been divided into sub-tasks in order to justify the sums allotted to each subcontractor.** **Secondarily, the anticipated expenditures for Tasks 2.1, 3.1.1 and 3.2.1 have not been justified and while it is perhaps clear what is involved in each task, I do not believe that pre-empts justifications.**
Rating	**good**

Overall

Provide a brief explanation of your summary rating.

Comments	**This is a competent team of researchers with a 4-phase project that is likely to achieve a high level of success. However, the proposal's Budget and Task Tables ought to be revised, as individual accountability and consequently fund allotment, is not completely clear. This would prevent CALFED from suffering an unnecessary financial loss. Additionally, verification of the previous implementation and success of IHSim would be prudent.**
Rating	**very good**